



THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

Faculty of Engineering and Technology

Department of Mechanical and Automotive Engineering

Bachelor of Engineering (Mechanical) (INSTITUTIONAL BASED)

Year 2 Semester II Special Examination

EME 4211 - INTRODUCTION TO ENGINEERING DESIGN

Series: October 2011

TIME: 2 HRS

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination

- Answer booklet
- Scientific calculator

This paper consists of FIVE questions

Answer question ONE and ANY OTHER TWO questions

Maximum marks for each question are shown

Q.1

A certain college intends to acquire furniture for their offices. They approach you to design a computer desk. The design is to be used to manufacture large number of similar desks.

The computer desk should have three levels for placing computer system, monitor and printer. Design the required desk and show by neat sketches the following.

- Adequate views to clarify your design

- ii) Approximate overall dimensions to suit the user
- iii) Joining methods

[30 marks]

Q.2

(a) Explain the following terms applied in engineering design:

- (i) lateral thinking
- (ii) brainstorming
- (iii) Anthropometrics
- (iv) network planning charts

[8 marks]

(b) Table I shows a list of activities and their time durations carried out during design and fabrication of a computer desk.

Table I

Activity	Time in days
Drawing	1.0
Purchasing wood	0.5
Purchasing pipes	0.5
Purchasing fasteners	0.5
Welding frame	1.5
Wood working	2.0
Assembly	1.5
Painting	2.0

- (i.) Construct a network using the data given in table I.
- (ii.) From the network determine the time required to complete the project and,
- (iii.) the critical path.
- (iv.) If woodwork was to take three days determine the critical path.

[12 marks]

Q. 3

The component shown in Fig. Q3 is a steel sleeve, which is to be manufactured in batches according to the terms of agreement in the contract. The component can be manufactured by any of the following methods:

- a) Machining from stock using capstan lathe
- b) Casting method by green sand casting

At the moment labour rates and the cost of materials to be used are as follows:

Machining method

- Setting of the capstan lathe takes 4 hours @ Kshs.1000 per hour
- Cutting of work piece from stock is rated at 2.5 minutes
- Machining outside diameter, 10 minutes
- Boring the internal hole 5 minutes

- Tool cost per work piece, Kshs.2
- Material cost per piece Kshs.30
- Labour charges for all machining operations shs.400 per hour
-

Casting method

- Setting of foundry equipment
- Starting the furnace and heating, 4 hours @shs.1500 per hour
- Preparation of moulds, sand and pattern, 24 hours @shs.350 per hours
- Cost of scrap materials 60kg @sh.50 per kg for casing 500 castings
- Cost of materials for patterns sand and moulds, 4200 per batch of 100 casting.

Advise the management on the most profitable method to be used. Provide also, the expected outlay and profits to be made on both methods. If 2000 components are ordered and 20% profit margin is expected. [20 marks]

Q. 4

- (a) Explain the following types of industrial models
- (i) Aesthetic/ ergonomic models
 - (ii) Qualitative test models [8 marks]
- (b) Briefly describe wind tunnel testing [4 marks]
- (c) Discuss the following aspects of aesthetic design
- (i) Symmetry and balance
 - (ii) Harmony and contrast [8 marks]

Q.5

- (a) Explain the following securing methods
- (i) Fastening systems with respect to screws and pins
 - (ii) Welding [12 marks]
- (b) Describe any FOUR methods that can be used to connect shafts end-to-end. [6 marks]

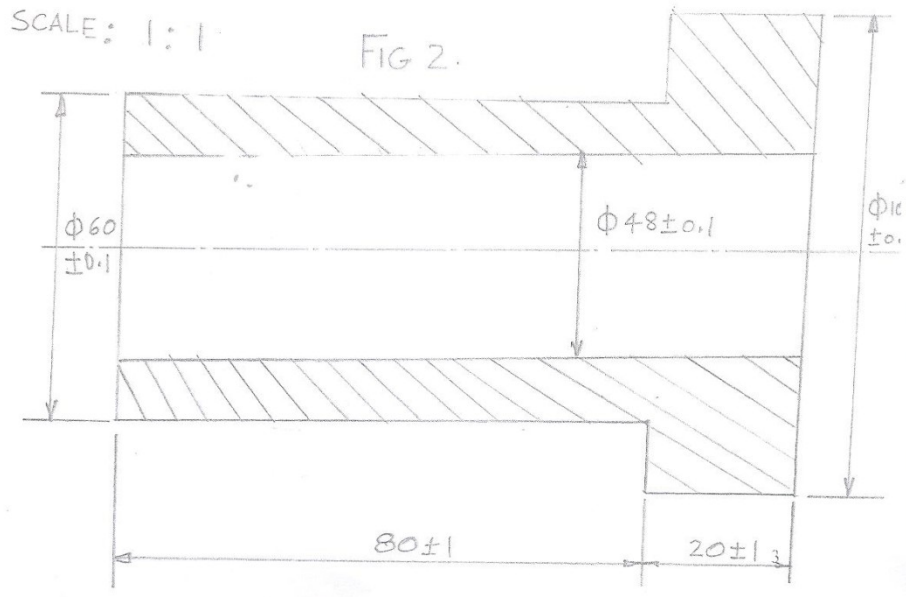


FIG. Q3: All dimensions in millimetres.